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H04Q 7/32

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(54) Abstract Title
**External power supply for a mobile communications device**

(57) A portable telephone transmits and receives data via a PCMCIA card to and from a portable personal computer. The PCMCIA card determines if the computer is connected to an external supply and provides data indicative of the presence of the supply to the portable telephone. A detector in the telephone determines from the data if an external supply is present, disconnects the internal cell from the internal circuitry and connects the external power source. Alternatively, the card itself may only provide an external power supply to the telephone if an external source is present at the computer. The external power supply is connected, if present, regardless of the internal cell voltage of the telephone.

FIG. 2

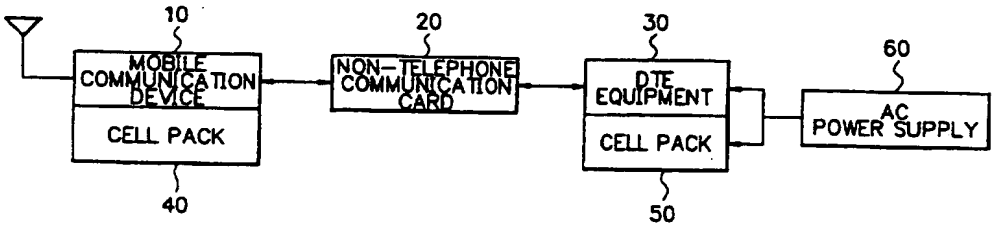


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FIG. 1

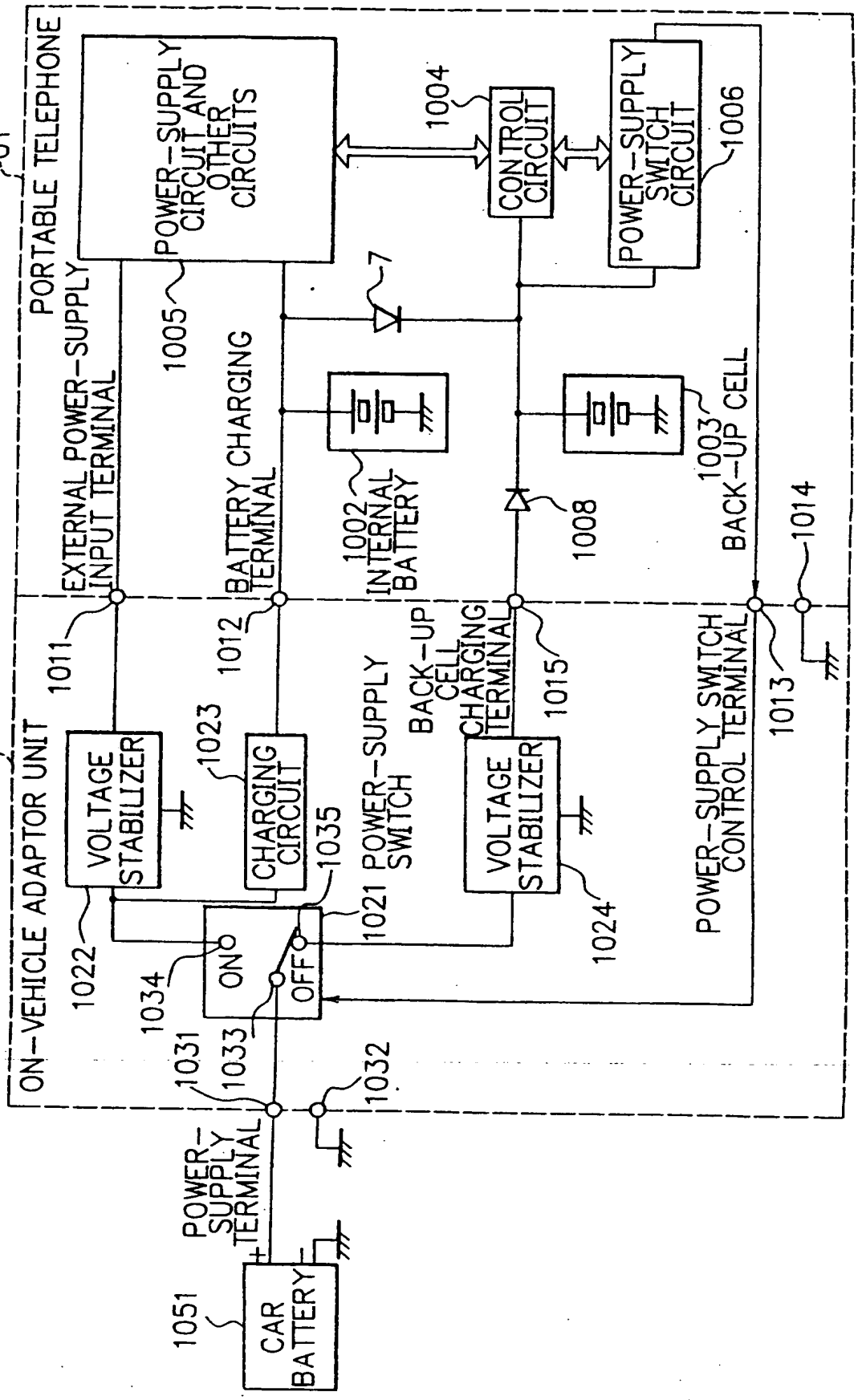


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FIG. 2

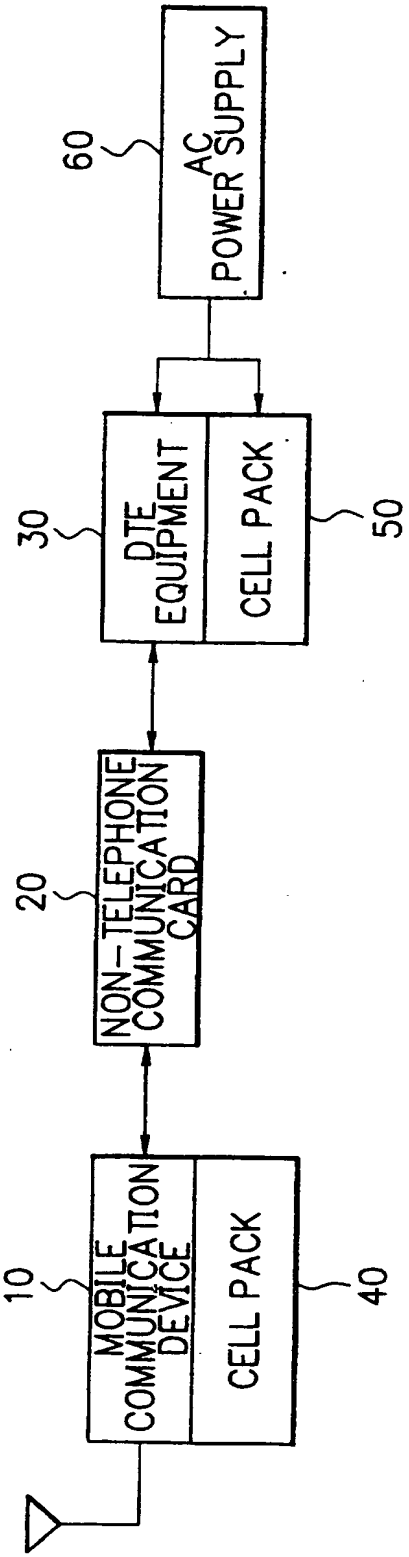


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FIG. 3

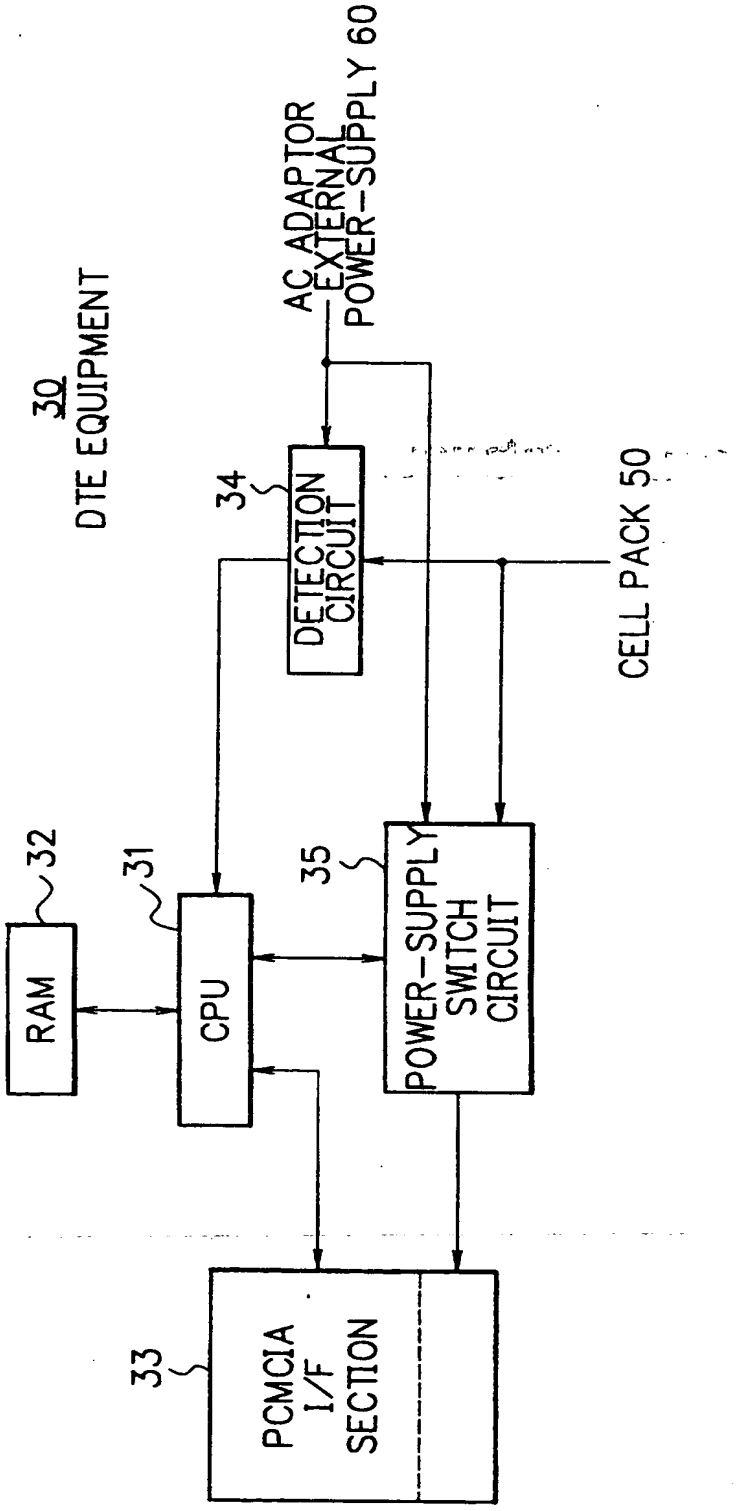


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FIG. 4

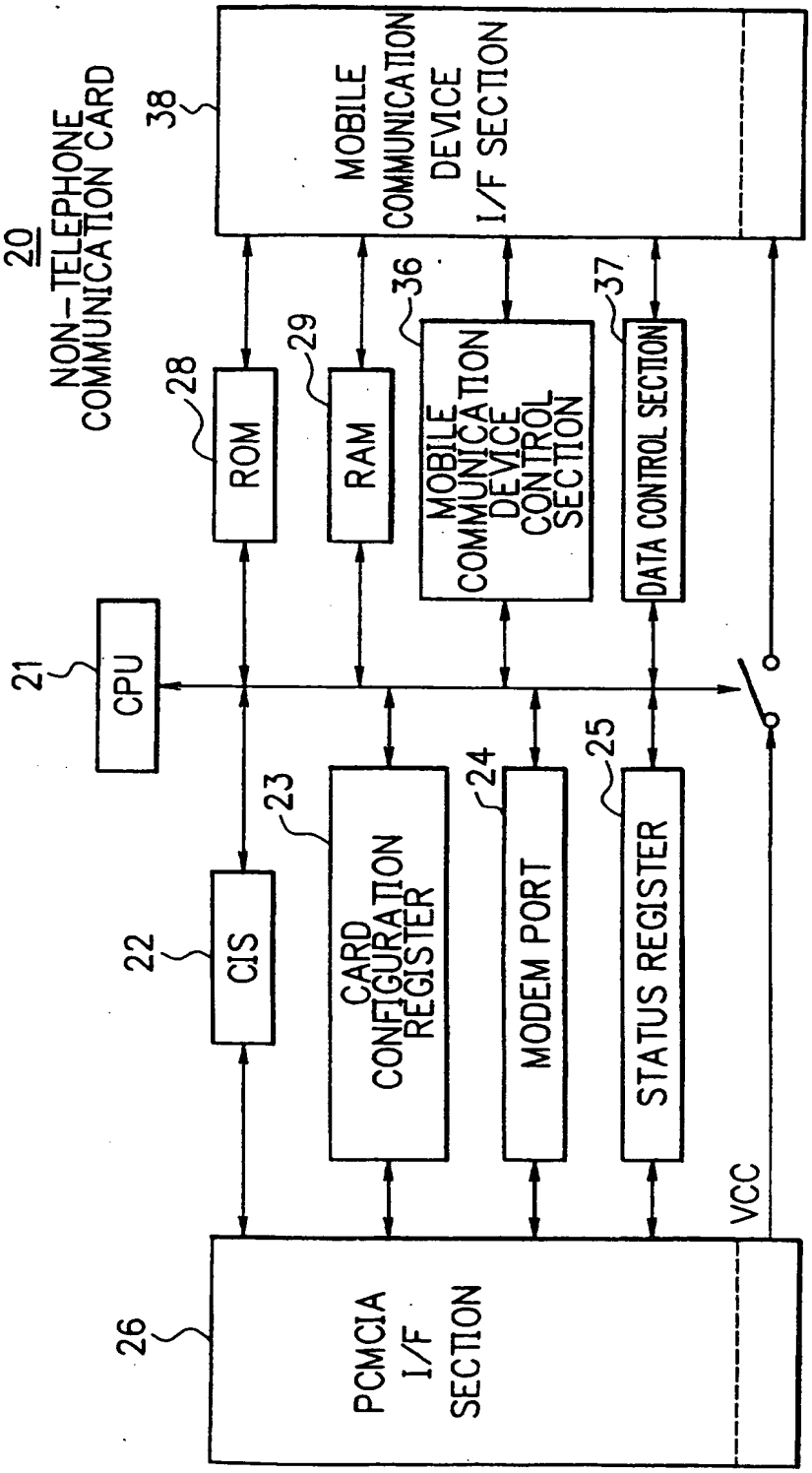


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FIG. 5

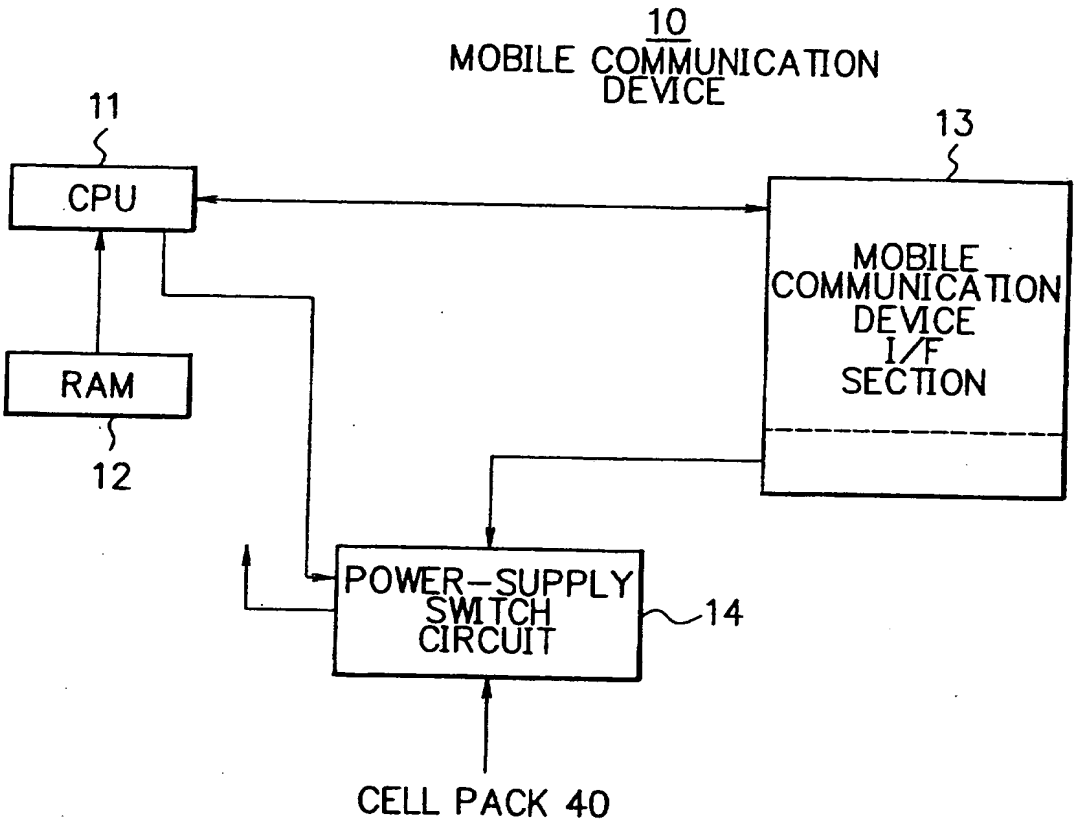


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FIG. 6

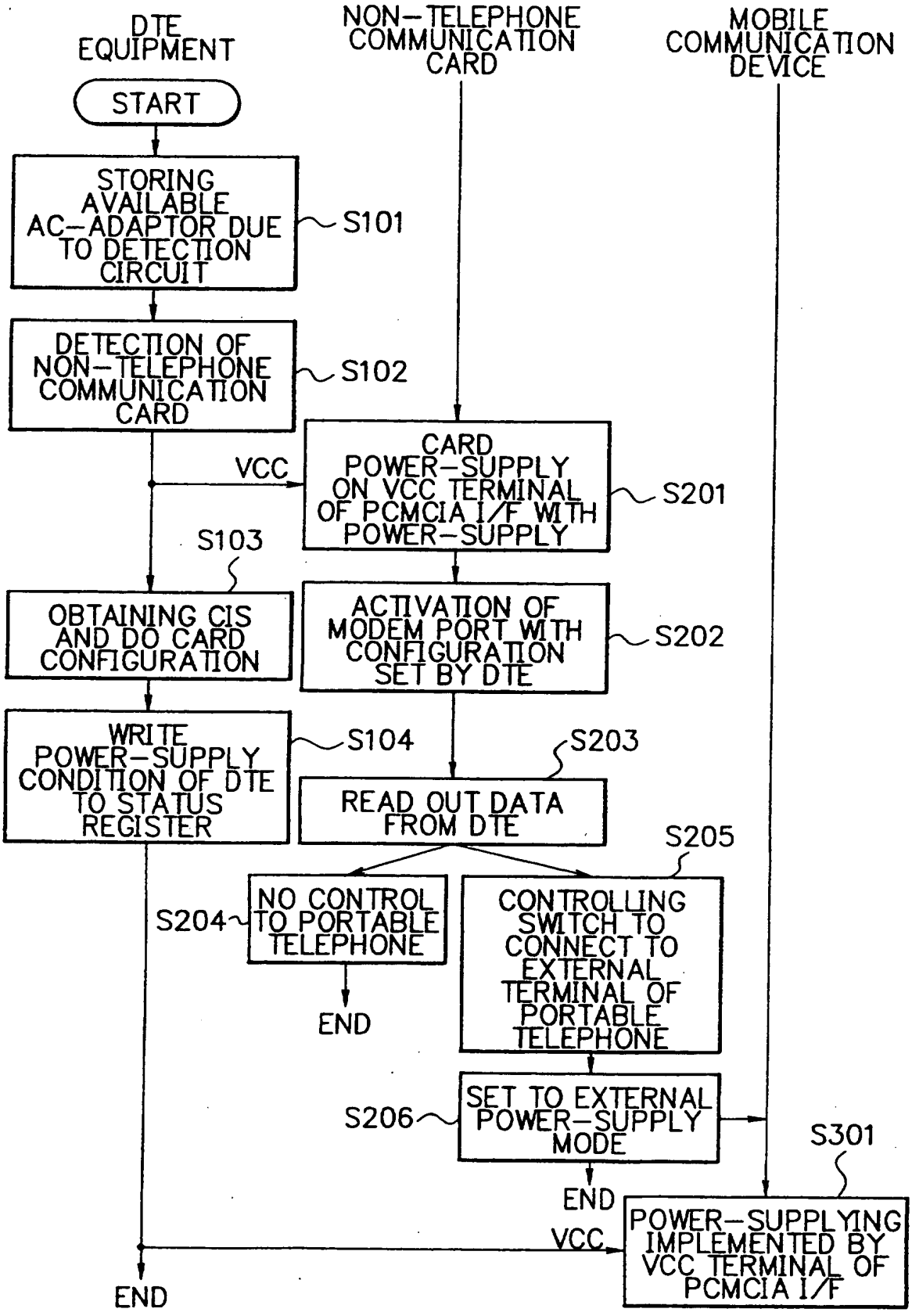


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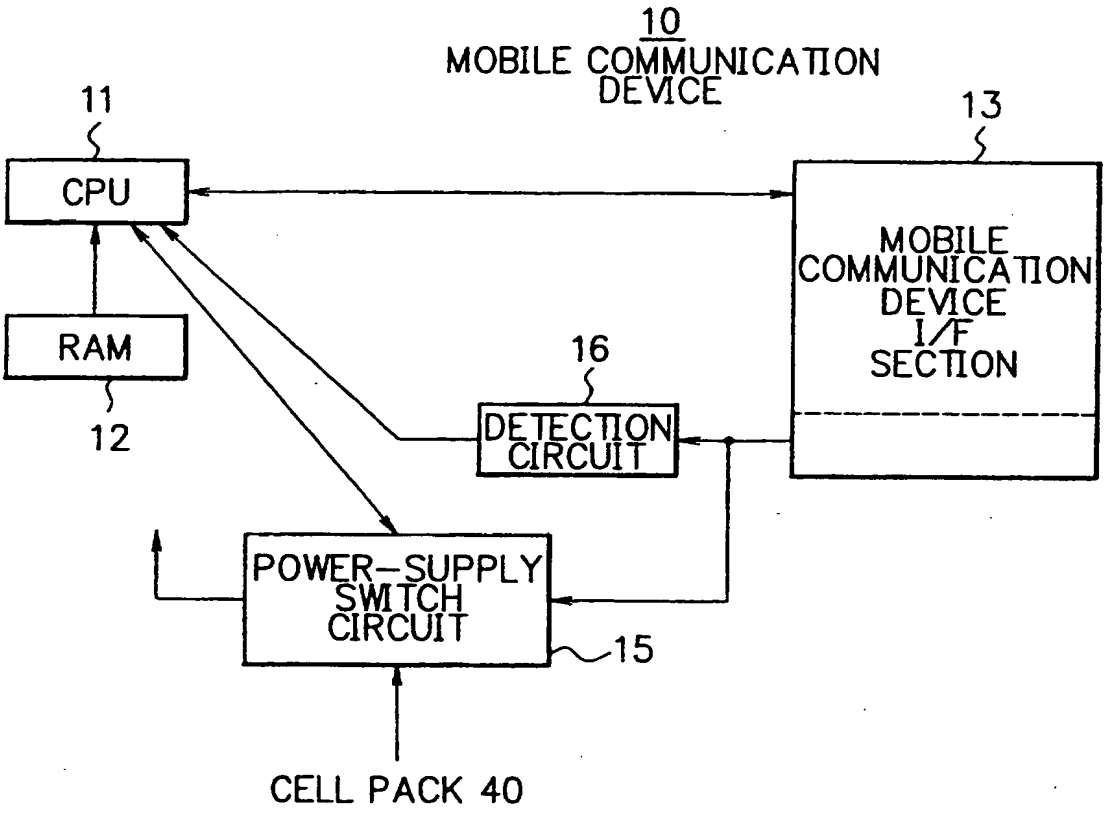
FIG. 7

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# RADIO COMMUNICATION APPARATUS AND METHOD OF OPERATION

The present invention relates to a radio communication apparatus and a method of operation, to a power-supply unit and a method of supplying power, and to a data terminal connection card apparatus which is suitable for making connection to a mobile communication device. Arrangements will be described below, by way of example in illustration of the invention which relate to the supply of power to a mobile communication device which provides radio data communication.

It has previously been proposed to supply power to a portable telephone from a car battery while the portable telephone, which is able to operate by means of an internal battery or a back-up cell, is connected to an on-vehicle adapter unit of an automobile. For example, in the specification of Japanese Patent Application Laid Open No. HEI 5-206926, there was proposed an on-vehicle adapter unit in which, if the power of an internal battery, or if that of a back-up cell, became low, an on-vehicle adapter unit restored the portable telephone to its ON-state, in order to enable it to be used, as a result of the operation of a power supply switch on the portable telephone.

Referring now to Fig. 1 of the accompanying drawings

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there is shown a block schematic diagram of the previously proposed on-vehicle adapter for a portable telephone.

In Fig. 1, a portable telephone U1 is shown connected to an on-vehicle adapter unit U2 by means of an external power-supply input terminal 1011, a battery charging terminal 1012, a back-up cell-charging terminal 1015, and a power-supply switch control terminal 1013. Further, a ground terminal 1014 of the portable telephone U1 is connected to ground.

When a power-supply switch 1021 of the on-vehicle adapter unit U2 is connected to a car battery 1051, and a power supply switch 1021 is connected to an OFF-terminal 1035, voltage from the car battery 1051 is supplied to a back-up cell 1003 of the portable telephone U1 through the back-up cell-charging terminal 1015 via a voltage stabilizer 1024. On the other hand, when the power-supply switch 1021 is connected to an ON-terminal 1034, voltage from the car battery 1051 is supplied to a power-supply circuit of the portable telephone U1 and the other circuit 1005 through the external power-supply input terminal 1011 as a result of the operation of a voltage stabilizer 1022. Further, an internal battery 1007 is also charged by the charging circuit 1023 through the battery charging terminal 1012.

Since a power-supply switch circuit 1006 of the portable telephone U1 interlocks the power-supply switch 1021 of the on-vehicle adapter unit U2, when the power-

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supply switch circuit 1006 is in the OFF-state, the power-supply switch 1021 is connected to the OFF-terminal 1035, while when the power-supply switch circuit 1006 is in the ON-state, the power-supply switch 1021 is connected to the ON-terminal 1034.

Thus, when the power-supply switch of the portable telephone U1 is in the OFF-state, the supply of power is provided from the car battery 1051 to the back-up cell 1003, while when the power-supply switch is in the ON-state, the supply of power is provided from the car battery to the internal battery 1002 and the respective circuits 1005.

This type of portable telephone may be connected to a personal computer in such a way that it causes information in the personal computer to be transmitted to another telephone or other apparatus from the portable telephone via a telephone line, or so that it causes information which has been transmitted from another telephone or other apparatus to be received and stored in the personal computer.

In the case in which the communication of information is carried out in an automobile, the personal computer and the portable telephone are normally supplied with power by their respective batteries. Otherwise, if the above technology is employed, the portable telephone may be supplied with power from the car battery.

However, the personal computer is normally driven independently by an interpolation battery, and if the

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voltage of the power-supply provided by the battery becomes low, it is not possible to use the personal computer. If, however, power is supplied from the car battery to the personal computer, communication may be made without an interpolation battery. In this case, however it is necessary to provide equipment for connecting the supply voltage from the car battery to the personal computer.

On the other hand, when the personal computer is in use indoors, it is possible to supply power to the computer from the AC power-supply source, however, it is not possible to supply power from this source to the portable telephone. Consequently, when the voltage of the interpolation battery of the portable telephone becomes low, communication cannot be implemented or maintained.

Features of arrangements to be described below, by way of example in illustration of the invention are the provision of a power-supply unit and a method for its use for a mobile communication device having a portable telephone and a personal computer, in which power is supplied from a data terminal unit of the personal computer, a mobile communication device in which it is possible to provide AC power from a data terminal unit regardless of the condition of an interpolation battery in the mobile communication device or of a detachable cell pack, and a data communication card which enables a voltage from a power supply to be provided from a data

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terminal unit to a mobile communication device while the data terminal unit is connected to the mobile communication device.

In one arrangement to be described below by way of example in illustration of the invention, a mobile communication device, which provides radio data communication between an external device and the mobile communication device, includes an input for inputting transmitted data to the external device, a detector for determining information concerning the external power-supply from information at the input, and means for providing a power-supply to respective circuits within the mobile communication device from the external power-supply according to the information concerning the external power-supply which is determined by the detector.

In one particular arrangement to be described in illustration of the present invention, by way of example, there is a card equipment for connecting a mobile communication device, which is for use in implementing radio data communication between an external device and the mobile communication device, to a data terminal transmitting data to the mobile communication device, the mobile communication device including a first connection means for implementing a connection to the data terminal, a store for storing information concerning the power supply from the data terminal through the first connection means, a second connection means for

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implementing a connection to the mobile communication device, a switch enabling a power supply to supply a voltage to the second connection means from the data terminal to which the power-supply voltage is input through the first connection means, and a control for implementing the control of the switch according to information stored in the store.

In another arrangement to be described below by way of example in illustration of the present invention, there is a power-supply unit of a mobile communication device for use in implementing radio data communication between an external device and the mobile communication device, the arrangement including a data terminal for transmitting data to the mobile communication device, and a card equipment for supplying the data to the mobile communication device while the data terminal is connected to the mobile communication device, wherein when the data terminal receives a supply of power from an external power-supply via an AC adaptor, the mobile communication device receives a supply of power from the data terminal through the card equipment.

In yet another arrangement to be described below by way of example in illustration of the present invention, a method of supplying power to a mobile communication device which provides data communication by radio between an external device and the mobile communication device, wherein there is a data terminal for transmitting data to the mobile communcation device, and a card equipment for

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supplying the data to the mobile communication device while connecting the data terminal to the mobile communication device, includes the steps of determining whether or not power is received via an AC adaptor from an external power-supply, and storing the result of the determination, wherein when the result of the determination is that the supply of power is from the external power-supply via an AC adaptor, the voltage from the AC adaptor external power-supply is provided to the mobile communication device through the data terminal and the card equipment.

As explained above, the mobile communication device judges whether or not a data terminal receives its power-supply via an AC adaptor external power-supply, and when the power is supplied via an AC adaptor from an external power-supply, it is caused to be supplied to the mobile communication device through the data terminal and a card equipment. Thereby, the mobile communication device is rendered capable of operation regardless of the voltage of any battery cell in the mobile communication device.

Arrangements which are for use in illustrating the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 2 is a block schematic circuit diagram,

Fig. 3 is a block schematic circuit diagram of a DTE unit shown in Fig. 2,

Fig. 4 is a block schematic circuit diagram of a

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non-telephone communication card for use in the arrangement shown in Fig. 2,

Fig. 5 is a block schematic circuit diagram of one arrangement for use in the circuit shown in Fig. 2;

Fig. 6 is a flow chart, and

Fig. 7 is a block schematic circuit diagram of another arrangement for use in the circuit shown in Fig. 2.

Referring to Fig. 2, there is shown a radio data communication device which includes a mobile radio communication device 10, a non-telephone communication card 20, and a data terminal equipment (DTE) 30. The mobile radio communication device 10 may, for example be an automobile telephone, a portable telephone, a second generation codeless telephone, or a two-way communications type pager. Further, the mobile radio communication device 10 is connected to a detachable cell pack 40 which supplies it with power. The cell pack 40 need not be detachable, it may be integrated into the mobile radio communication device 10.

Preferably, the non-telephone communication card 20 is a data terminal connection card which enables data communication to take place between the mobile radio communication device 10 and the DTE equipment 30. It is preferable that the non-telephone communication card 20 should be connected to the DTE equipment 30 by a PCMCIA interface, namely, a PCMCIA connector, and that the non-telephone communication card 20 should be connected to

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the mobile radio communication device 10 by a telecommunication cable. The non-telephone communication card 20 may be referred to as a memory card, a modem card, or a PCMCIA card.

The DTE equipment 30 may be a personal computer or a portable information terminal, and a cell pack 50 may be integrated into the DTE equipment 30, in order to provide a power supply. Alternatively the cell pack 50 may be detachable from the DTE equipment 30. An AC power-supply 60, when it is connected to the DTE equipment 30, provides the power supply for the DTE equipment 30, and may also be used to charge the cell pack 50. However, these features are not critical to the present invention. The mobile communication device 10 is a device which provides radio connection with a base station and which is capable of implementing data communication. Preferably, the DTE equipment 30 is equipment which stores data, and which is capable of transferring the stored data. The non-telephone communication card 20 makes data transfer possible between the mobile communication device 10 and the DTE equipment 30.

Fig. 3 is a block schematic circuit diagram showing the DTE equipment 30 in the radio data communication device. Although the equipment 30 functions as normal DTE equipment only the features relevant to the present invention will be described.

In Fig. 3, the DTE equipment 30 has a CPU (central processing unit) 31 which also controls various functions

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in the ordinary operation of the DTE equipment 30, and a RAM (random access memory) 32 which stores data. Further the DTE equipment 30 has a PCMCIA interface (I/F) section 33 which takes charge of connection to the non-telephone communication card 20. Data stored in the RAM 32 is output to the non-telephone communication card 20 through the PCMCIA I/F section 33. Data from the non-telephone communication card 20 is stored in the RAM 32. The PCMCIA I/F section 33 effects data communication as well as the supply of power to the non-telephone communication card 20.

A detection circuit 34 determines whether the power is supplied from the cell pack 50 or from the AC adaptor external power-supply 60. Preferably this determination is always implemented, or is carried out at certain time intervals. The result of the determination is output to the CPU 31. When the cell pack 50 is charged by the AC adaptor external power-supply 60, it is enough to determine whether or not power is being supplied from the AC adaptor external power-supply 60. A power-supply switch circuit 35 is switched under the control of the CPU 31. The power-supply switch circuit 35 controls the supply of power from either the cell pack 50 or the AC adaptor external power-supply 60 to the PCMCIA I/F section 33.

Next, the operation of the DTE equipment 30 shown in Fig. 3 will be described.

The power supply voltage from the cell pack 50 or

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the AC adaptor external power-supply 60 is provided at least to the CPU 31, the RAM 32, and the detection circuit 34, according to the determination by the detection circuit 34 whether or not power is supplied from the AC adaptor external power-supply. The result of determination is provided to the CPU 31, and stored in the RAM 32. For example, the CPU 31 stores in such a way that when the power is supplied from the AC adaptor external power-supply 60, a "1" is stored, while when the power supplied is not from the AC adaptor external power-supply 60, a "0" is stored.

When the non-telephone communication card 20 is connected to the PCMCIA I/F section 33, the CPU 31 detects the connection, thus implementing switching the power-supply switch circuit 35 according to the result of the determination which has been stored in the RAM 32. Thus, when the AC adaptor external power-supply 60 is connected thereto, the CPU 31 supplies the power-supply voltage to the PCMCIA I/F section 33 while selecting the power-supply voltage from the AC adaptor external power-supply 60. While when the AC adaptor external power-supply 60 is not connected thereto, the CPU 31 selects the power-supply voltage from the cell pack 50 to supply the power-supply voltage to the PCMCIA I/F section 33.

The data and the result of the judgement or determination stored in the RAM 32 are supplied to the PCMCIA I/F section 33 through the CPU 31.

The PCMCIA I/F section 33 outputs data from the RAM

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32 and the power-supply voltage of the power-supply switch circuit 35 to the non-telephone communication card 20.

Referring now to Fig. 4, the non-telephone communication card 20 is shown for connection between the PCMCIA I/F section 33 of the DTE equipment 30 and the PCMCIA I/F section 26.

The non-telephone communication card 20 has card attribute information (CIS) 22, a card configuration register 23, and a modem port function section 24. The card attribute information (CIS) 22 is stored information which denotes a drive function at the side of the memory card, which information is carried on an ordinary modem card, a memory card or a PCMCIA card. The modem port function section 24 implements parallel to serial conversion of the data. These respective sections are controlled by the CPU 21.

A status register 25 is a register which stores the result of the judgement or determination which is output from the DTE equipment 30, and it is capable of writing from the DTE equipment 30. The CPU 21 controls a switch 27 based on the storage condition of the status register 25. Namely, the non-telephone communication card is operated while receiving power supplied from the DTE equipment 30. The non-telephone communication card is incapable of outputting the power supply VCC which is supplied to the other side, however, when the power is supplied from the AC adaptor external power-supply 60, it

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causes the power-supply voltage VCC to supply power to the mobile communication device 10 through the switch 27 and the mobile communication I/F section 38. It is also preferable to rewrite the content of the status register 25 according to the control of the CPU 21.

Further, the non-telephone communication card 20 has a ROM 28 and a RAM 29 as a program memory and a work memory respectively. A mobile communication device control section 36 is connected to and controls the mobile communication device 10. For example, when a portable telephone is connected as the mobile communication device 10, the mobile communication device control section 36 implements the call control of the portable telephone, or the power-supply control through the mobile communication device I/F section 38. These controls make possible operation from the side of the DTE equipment 30, as well as automatic answering and automatic call out, such as call out and call in. A data control section 37 carries out the channel coding of the data which is transmitted and/or received to/from the mobile communication device 10, in addition to implementing protocol conversion which may be indicated at the side of the DTE equipment 30.

Next, the operation of the non-telephone communication card 20 will be described. A CIS 22 is scanned by the DTE equipment 30, so that a value which is capable of configuration is written to a card configuration register 23. The CPU 21 enables a modem

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port 24 to use according to the value written to the card configuration register 23, thus terminating the configuration of the card.

In the status register 25, a write instruction is implemented by the DTE equipment 30, and information concerning whether or not power is supplied from the AC adaptor external power-supply 60 is stored. The CPU 21 judges the information stored in the status register, if it determines that the power supply is from the AC adaptor external power-supply 60, the switch 27 is caused to be ON, while if the power supplying is not determined to be from the AC adaptor external power-supply 60, the switch 27 is caused to be OFF. When the switch 27 is in its ON-state, the power-supply voltage from the PCMCIA I/F section 26 is supplied to the mobile communication device I/F section 38 through the switch 27.

In referring to Fig. 5 only the parts of the mobile communication device 10 which relate to the present invention will be described. Although there is no description in Fig. 5, necessary constitution and function are provided therewith as the mobile communication device as a matter of course.

In Fig. 5, a CPU 11 is connected to the non-telephone communication card 20 through a mobile communication device I/F section 13. The CPU 11 controls a power-supply switch circuit 14 while inputting a power-supply control signal from the mobile communication device I/F section 13 transmitted from the non-telephone

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communication card 20 through the mobile communication device I/F section 38. Here, the power-supply control signal is a signal which denotes that the power supply is from an external power-supply source. When the power-supply control signal is received, the power-supply voltage from the DTE equipment 30 is supplied to the respective sections by the power-supply switch circuit 14 under the control of the CPU 11. While when no power-supply control signal is received, the power supply voltage from the cell pack 40 is supplied to the respective sections through the power-supply switch circuit 14 directly.

A RAM 12 stores information data which is obtained by radio communication between the mobile communication device 10 and the base station, as well as data input from the non-telephone communication card. The RAM 12 may store data transmitted to the non-telephone communication card, as well as the power supply control signal.

It is preferable that the mobile communication I/F section 38 is connected to the mobile communication device I/F section 13 by means of a telecommunication cable. The telecommunication cable may have approximately 16 signal lines, however only 8 or 9 signal lines are for use in practical data communication, the other signal lines are normally not in use for this purpose. Preferably, the power-supply current is supplied to the mobile communication device 10, which

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current is received from the DTE equipment 30 using the remaining signal lines from the AC adaptor external power-supply 60. With respect to the power-supply control signal, it is preferable that unused signal lines are used.

Referring now to Fig.6, firstly, the DTE equipment 30 causes the condition of the power supply which is detected by the detection circuit 34 to be stored in the RAM 32 (STEP S 101). Normally, the CPU 31 stores "1" in the RAM 32 when the power supply is from the AC adaptor external power-supply 60, while the CPU stores "0" in the RAM 32 when the power supply is from the AC adaptor external power-supply 60.

Next, the CPU 31 detects whether or not the non-telephone communication card 20 is connected to the PCMCIA I/F section 33 (STEP S 102). Upon the connection of the non-telephone communication card, the DTE equipment 30 supplies the power-supply of either the cell pack 50 or the AC adaptor external power-supply to the non-telephone communication card 20 from the VCC terminal of the PCMCIA I/F section 33. The non-telephone communication card 20 comes into an operational condition while receiving power supplied from the VCC terminal of the PCMCIA I/F section 26, namely card power-supply is brought into the ON-state (STEP S 201).

The DTE equipment 30, continuously, scans CIS 22 of the non-telephone communication card 20, thus obtaining card attribute information, so that it causes the

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configuration of the card to implement (STEP S 103). Subsequently, the DTE equipment 30 writes the condition of the power-supply means to the status register 25 of the non-telephone communication card 20 (STEP S 104).

On the other hand, when the power-supply is in the ON-state, the non-telephone communication card 20 activates the modem port 24 in answer to the configuration information sent to the card configuration register 23 under the control of the DTE equipment 30 (STEP S 202). Continuously, in answer to information written into the status register 25, the CPU 21 judges whether or not it should control the switch 27 to implement (STEP S 203). Namely, if the power supply is from the cell pack 50 of the DTE equipment 30, the switch 27, which is normally in the OFF-state is not operated, thus no control signal is sent to the mobile communication device 10, such as a portable telephone (STEP S 204). While, if the power supply is from the AC adaptor external power-supply 60, which is connected to the DTE equipment 30, the CPU 21 causes the switch 27 to be in the ON-state, thus connecting the VCC terminal of the mobile communication device I/F section 38 to the VCC terminal of the PCMCIA I/F section 26 (STEP S 205). The CPU 21 then sets the mobile communication device 10 to the external power-supply mode, while implementing the control of the external signal lines of the mobile communication device 10 (STEP S 206). Namely, the CPU 21 transmits the power-supply control signal to the mobile

communication device 10, noting that the power supply is from the AC adaptor external power-supply 60 to the mobile communication device 10.

In the mobile communication device 10, when the power-supply control signal is received, the power-supply mode is the external power-supply mode, and the supply of power to the respective sections is implemented from the VCC terminal of the PCMCIA I/F section 13 (STEP S 301).

In the above-described embodiment, the power-supply control signal is transmitted to the mobile communication device 10 from the non-telephone communication card 20. However, it may be preferable to provide a control based on whether or not the power-supply voltage is detected from the VCC terminal of the I/F section 13 at the mobile communication device 10.

In the arrangement shown in Fig. 7, the CPU 11 is connected to the non-telephone communication card 20 through the mobile communication device I/F section 13. A detection circuit 16 detects whether or not there is a supply of power from the mobile communication device I/F section 13. When there is a supply of power, a power-supply voltage from the DTE equipment 30 is provided to the respective sections via the power-supply switch circuit 15 under the control of the CPU 11. While when there is no supply of power, a power-supply voltage from the cell pack 40 is supplied to respective sections through the power-supply switch circuit 15. The detection circuit 34 of the DTE equipment 30, namely, it

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is preferable always to detect whether or not there is power-supply. Also it is preferable to detect whether or not there is power-supply at fixed time intervals.

The RAM 12 of Fig. 7 has a similar function to that of the RAM 12 shown in Fig. 5, however, the RAM 12 of Fig. 7 is capable of storing the result of any detection by the detection circuit 16, instead of the power-supply control signal.

It will be understood that an arrangement has been described above, which is capable of supplying a power-supply voltage to a mobile communication device from an AC adaptor external power-supply through a DTE equipment and/or a non-telephone communication card. Consequently, it is capable of implementing communication without the need for a power-supply voltage from a cell pack of the mobile communication device. Further, the arrangement is capable of supplying power from only one power-supply unit.

While particular embodiments illustrative of the invention have been described by way of example, it will be understood that variations and modifications thereof, as well as other embodiments, may be conceived within the scope of the following claims.

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## CLAIMS

1. A mobile communication device for use in implementing radio data communication between an external device and the mobile communication device including an input for inputting data transmitted to the external device, a detector for determining the condition of an external power-supply from information provided at the input, and means for providing a supply of power to respective circuits in the mobile communication device from the external power-supply according to the information concerning the condition of the external power-supply which is determined by the detector.

2. A mobile communication device as claimed in claim 1, wherein the input is connected to a card equipment which is connected to a data terminal unit which has the data.

3. A mobile communication device as claimed in claim 2, wherein the information concerning the condition of the external power-supply is output from the card equipment.

4. A mobile communication device as claimed in claim 2, wherein the detection of the information concerning the external power-supply is determined by the detection of the voltage of the external power-supply.

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5. A method of communicating between an external device and a mobile communication device including the steps of inputting data transmitted to the external device, detecting information concerning the supply of power from an external power-supply from information at the input means, and implementing the supply of power to respective circuits in the mobile communication device from the external power-supply according to the information concerning the external power-supply which has been detected.

6. A card equipment for use in connecting a mobile communication device providing radio data communication between an external device and the mobile communication device including a first connection means for making a connection to the data terminal, a store for storing information concerning the supply of power from the data terminal through the first connection means, a second connection means for making connection to the mobile communication device, a switch for enabling a power-supply voltage to be provided to the second connection means from the data terminal to which the power-supply voltage is input through the first connection means, and a control for implementing the control of the switch according to information stored in the store.

7. A card equipment as claimed in claim 6, wherein the first connection means is a PCMCIA connector.

8. A card equipment as claimed in claim 6, wherein the first connection means is a PCMCIA connector and the second connection means is a telecommunication cable.

9. A card equipment as claimed in claim 6, in which when information which is stored in the store denotes that power is supplied from an AC adaptor power-supply, it causes the power-supply voltage to be supplied to the second connection means.

10. A card equipment as claimed in claim 9, wherein the first connection means is a PCMCIA connector, and the power-supply voltage is supplied through a power-supply terminal of the PCMCIA connector.

11. A method of supplying power to a card equipment including the steps of implementing a connection to a data terminal by a first connection means, storing in a store information concerning the supply of power from the data terminal through the first connection means, implementing a connection to a mobile communication device by a second connection means, enabling a power-supply voltage to be supplied to the second connection means from the data terminal to which the power-supply voltage is input through the first connection means, and implementing the control of a switch according to information stored in the store.

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12. A power-supply unit of a mobile communication device which provides radio data communication between an external device and the mobile communication device including a data terminal for transmitting data to the mobile communication device, and a card equipment for supplying the data to the mobile communication device while connecting the data terminal to the mobile communication device, wherein when the data terminal receives a supply of power from an AC adaptor external power-supply, the mobile communication device receives power-supply from the data terminal through the card equipment.

13. A power-supply unit of a mobile communication device as claimed in claim 12, wherein the mobile communication device is capable of being supplied with power from a cell, when a changeover from the supply of power from an AC adaptor external power-supply to a supply of power from a cell is implemented.

14. A method of supplying power to a mobile communication device for use in providing data communication by radio between an external device and the mobile communication device, which includes a data terminal for use in transmitting data to the mobile communication device, and a card equipment for supplying the data to the mobile communication device while the data terminal is connected to the mobile communication

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device, the method including the steps of determining whether or not power is supplied via an AC adaptor from an external power-supply, and storing the result of the determination, wherein when the result of the determination denotes that the power is received from an external power-supply via an AC adaptor, the power-supply voltage obtained via the AC adaptor from an external power-supply is supplied to the mobile communication device through the data terminal and the card equipment.

15. A mobile communication device as claimed in claim 1 including an arrangement substantially as described herein with reference to any one of Figs. 2 to 7 of the accompanying drawings.

16. A method of communicating as claimed in claim 5 substantially as described herein with reference to any one of Figs. 2 to 7 of the accompanying drawings.

17. A card equipment as claimed in claim 6 including an arrangement substantially as described herein with reference to any one of Figs. 2 to 7 of the accompanying drawings.

18. A method of supplying power to a card equipment as claimed in claim 11 substantially as described herein with reference to any one of Figs. 2 to 7 of the accompanying drawings.

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19. A power supply unit as claimed in claim 12 substantially as described herein with reference to any one of Figs. 2 to 7 of the accompanying drawings.

20. A method of supplying power as claimed in claim 14 substantially as described herein with reference to any one of Figs. 2 to 7 of the accompanying drawings.

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| **Application No:** | GB 9805823.3 | **Examiner:** | Glyn Hughes |
| **Claims searched:** | 1 to 20 | **Date of search:** | 7 September 1998 |

## Patents Act 1977
## Search Report under Section 17

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): H4L (LECTX, LECTP, LECX)

Int Cl (Ed.6): H04B 1/16, 1/38, H04M 1/72, H04Q 7/32

Other:

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| X | GB 2318255 A | (IBM) see in particular page 12 lines 1 - 5 | 12 |
| X | WO 96/21900 A1 | (INTEL) see figure 1 | 6, 11, 12 |

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|---|---|---|---|
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